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NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

FORECASTING MODEL FOR FUTURE NEEDS REQUIREMENT FOR SPARE PARTS IN FMS SALES

by

Steven J. Colcombe

December 2000

Principal Advisor:
Associate Advisor:

Michael W. Boudreau
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**FORECASTING MODEL FOR FUTURE NEEDS REQUIREMENT FOR SPARE
PARTS IN FMS SALES**

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B.S., Old Dominion University, 1988

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the


**NAVAL POSTGRADUATE SCHOOL
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ABSTRACT

This research focuses on Italy, Brazil and the Republic of Korea, how each purchased the US Marine Corps' Advanced Amphibious Vehicle (AAV), and how each supports the AAV through the life-cycle requirements. The thesis provides insights through an in-depth analysis of each country's political, economic and defense aspects. A predictive model determines the support requirements on future FMS sales by studying the past. Thus, the Marine Corps can estimate the future requests for spare parts in support of the AAV.

The research identifies political stability, economies of scale, and trust between the foreign government and the seller as the major factors needed to predict decisions about procurement of spare parts through FMS.

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I. INTRODUCTION

A. PURPOSE

The purpose of this research is to analyze the historical data from three countries—Italy, Brazil and South Korea—and develop a predictive model to determine future support requirements. Although all three countries purchased the Amphibious Assault Vehicle (AAV) via Foreign Military Sales (FMS), they used different methods of purchase and support to attain their life-cycle requirements. This research will analyze the three different approaches and other salient economic, political, and defense aspects.

B. BACKGROUND

The Amphibious Assault Vehicle (AAV) was originally manufactured in the early 1970's to enhance the United States Marine Corps' amphibious capabilities. Over the years it has gone through numerous upgrades. Many allies have realized the capability that the AAV brings to their military, and have acquired it through Foreign Military Sales (FMS). A new amphibious vehicle, the Advanced Amphibious Assault Vehicle (AAAV), is roughly 10 years away from being fielded. The Marine Corps is already looking for allies to participate in the cost sharing in the production of the AAAV. It is important to understand the needs of the countries that are asked to become involved. Due to the expected cost of \$5.0 million per vehicle, the Marine Corps needs these countries to help lower its unit cost through economies of scale. In an era of lower defense budgets, this can be accomplished when an FMS customer purchase increases volume production, which in turn lowers unit costs for US customers.

The Marine Corps is not only concerned about the production costs of the AAV, but also the life-cycle costs. Once the AAV is fielded, the lifetime maintenance costs of the vehicle will increase as the production line closes after the last AAV is produced. The same economies of scale that would bring the cost of the AAV down will bring the cost of the spares down as well. Yet, a problem results when the foreign customer seeks spares from other sources, in which case the Marine Corps does not benefit from economies of scale. The question is, can the Marine Corps predict the future sources of spares that the foreign customer will request? The answer is yes. By studying historical data of previous FMS sales of a similar vehicle, the Amphibious Assault Vehicle (AAV), the Marine Corps can predict what sources will be utilized to purchase spares in support of the life-cycle requirements of the AAV.

This research will focus on Italy, Brazil and the Republic of Korea, how each purchased the AAV, and how each supports the AAV through the life-cycle requirements. An in-depth analysis will be made of each country's political, economic and defense factors. In the end, a better predictive model will be developed to determine the support requirements on future FMS sales. Thus, the Marine Corps might better estimate the future requests for spares in support of the AAV.

Italy purchased 25 Landing Vehicles Tracked Personnel (LVTP 7) variants (an early version of the AAV) in the early 1970's under the Military Assistance Program (MAP). No support was delivered under the MAP. It is believed that Italy supports its vehicles indigenously. Italy is currently interested in upgrading its amphibious vehicles as well as procuring additional new vehicles. United Defense (UDLP) plans to sell nine AAVs with the Reliability, Availability, Maintainability, Rebuild to Standard (RAM/RS)

upgrade on a direct commercial basis. The proposal includes the outfitting of USMC AAV hulls with all new components. UDLP also plans to share the work with Italy through a kit installation program.

The Brazil Marine Corps (BRMC) procured 14 AAV variants and associated support from the USMC under an FMS program. The vehicles and associated support were delivered in May 1997. These vehicles complemented the initial 12 AAVs delivered in 1985 under FMS. Brazil has supported their AAVs through various FMS cases, to include spares, repair parts, publications, Engineering Change Proposals (ECP) notifications and schoolhouse training. They are currently asking for pricing data through FMS to upgrade all 26 vehicles to resolve configuration problems.

The Republic of South Korea (ROK) Marine Corps procured a total of 42 AAV variants from the USMC in 1985. South Korea has the second largest AAV fleet. The South Koreans have utilized the FMS follow-on support cases to support all of their variants for the last several years. Most vehicle repairs and maintenance are conducted by the ROK Marine Corps, with some support coming from their industrial base. Currently, through a direct arrangement between UDLP and Samsung, the Koreans are co-producing 57 AAV variants.

With this variety in approaches to life cycle support, an in-depth study can determine the various factors involved in decision-making in support of the AAV, providing insight into how allies decide on system support.

C. RESEARCH QUESTIONS

This thesis addresses a primary research question as well as several secondary questions. The primary research question is: What is the primary factor in determining the future method of purchasing spares in FMS sales?

The secondary research questions are:

- Why is the U.S. Government involved in weapon system sales to foreign nations?
- What is the FMS history of amphibious vehicles and what future FMS activities are anticipated for the AAV?
- What part do politics, economics and defense play in FMS and spare parts purchase requirements?
- What are the advantages and disadvantages to the U.S. Marine Corps of a predictive model for determining the future methods of purchasing spare parts in FMS?
- What conclusions and recommendations result from this study?

D. SCOPE AND METHODOLOGY

This thesis will analyze the procurement policies of three countries, Italy, Brazil and South Korea, to model the needs for life-cycle requirements in future FMS cases. The foreign sales process starting with the FMS program, the Direct Commercial Sales (DCS) program, and offsets will accomplish this. The history of the AAV will be explained including a description of the recent upgrades contained in the Reliability, Availability, Maintainability, Rebuild to Standard (RAM/RS) program, all of which will carry the AAV until its successor, the AAV is fielded. This thesis will include an in-depth analysis of the political, economic and defense factors of Italy, Brazil and South

Korea to determine the rationale for their decisions on life-cycle support. The desired result will be a predictive model to explain the purchase of spares in FMS cases.

The methodology used in this research consists of the following steps:

- Conduct a literature search of books, magazine articles, CD-ROM systems, Government reports; Internet-based materials and other library information resources.
- Conduct interviews via phone and e-mail with personnel at Marine Corps Systems Command that are involved in the FMS program.
- Conduct interviews with UDLP, the producers of the AAV.
- Look for trends or key elements that will allow the FMS cases to be categorized and analyzed.
- Develop a model concerning economic, political and defense factors in determining the future requirements for spares support.

E. ORGANIZATION OF STUDY

Chapter II provides background on the FMS program and Direct Commercial Sales (DCS) program. It also explains offsets and how they affect US companies. The chapter concludes with an explanation of why the US is involved in FMS/DCS.

Chapter III describes the AAV's FMS history and future with an historical analysis of the AAV. The chapter concludes with an explanation of the Business Enterprise Partnership (BPA) and who it benefits.

Chapter IV presents the unique political, economic and defense factors that influence FMS in each analyzed country: Italy, Brazil and South Korea.

Chapter V is an analysis of the factors and influences presented. The chapter develops a model of predictive support requirements in FMS sales.

Chapter VI concludes the thesis with direct answers to the primary and secondary research questions. Areas of future research are identified.

F. BENEFIT OF STUDY

This thesis is intended to primarily benefit the FMS office at Marine Corps Systems Command and other FMS activities throughout the Department of Defense. The historical review and analysis will assist future weapon systems FMS sales in determining the request for spares so the Program Manager's office can better formulate economies of scale.

II. BACKGROUND

A. FOREIGN MILITARY SALES

There is a tradition of cooperation between the United States (US) and other sovereign nations who have similar values and interests to strive to meet common defense goals; this is called Security Cooperation. It consists of a group of programs authorized by the US Foreign Assistance Act of 1961 and the Arms Export Control Act and related statutes by which the US Department of Defense (DoD) and a commercial contractor provide defense articles and services in furtherance of national policies and objectives. [Ref. 1]

Foreign Military Sales (FMS) and International Military Education and Training (IMET) are two key programs included within Security Cooperation. IMET is conducted solely on a grant basis. FMS can be conducted using cash or FMS Financing. [Ref. 1] This part of the thesis will focus on FMS.

Foreign Military Sales (FMS) is defined as a portion of the US security assistance authorized by the Arms Export Control Act (AECA) of 1976. It is conducted on the basis of formal contracts or agreements between the United States Government (USG) and an authorized recipient government or international organization. FMS includes government-to-government sales of defense articles or defense services, from DoD stocks or through purchase under DoD managed contracts, regardless of the source of financing. [Ref. 2]

FMS is usually a non-appropriated program through which eligible foreign governments purchase defense articles, services and training from the USG. Some FMS programs may be funded through the Foreign Military Financing Program (FMFP) that uses appropriated funds. The purchasing government pays all costs (either with cash deposits or FMFP credits) that may be associated with a sale. In essence, there is a signed government-to-government agreement, normally documented by a Letter of Offer and Acceptance (LOA) between the USG and the foreign government. [Ref. 2]

FMS is operated and managed by DoD on a non-profit and no-loss basis. DoD usually charges a fee of 3% (currently the Marine Corps charges 2.5%) to the receiving nation based on the overall cost of purchase to pay for administering the program. [Ref. 3]

Defense articles, including major defense systems, subsystems, support equipment, repair parts and publications are provided under FMS. Services include training in US military schools or through Mobile Training Teams (MTTs). Contract administration, program management, technical support and repairs are also provided under FMS. Due to interest in encouraging standardization and interoperability between US and security cooperation nations, FMS normally involves the transfer of those items that previously have been used by the US forces. [Ref. 1] Two good examples of this are Norway and the Republic of Korea, both buying F-16 Fighters, thirty and twenty respectfully [Ref. 4].

FMS does not just happen. Many US Government agencies are involved to ensure the US Public's interest is always being served. The US Congress establishes the

laws, authorizes programs, appropriates funds and has an oversight role in security cooperation. The principal legislated responsibilities fall to the Department of State (DoS) and DoD. The Secretary of State provides continuous supervision and general direction for FMS, including the determination of whether there will be a program for a country and, if so, its scope and whether, and when, a particular sale will be made. [Ref. 1]

The Secretary of Defense implements programs to transfer defense articles and services. Each recipient country has a US diplomatic mission for in-country management of the FMS program. The Security Assistance Officer (SAO) provides oversight for the FMS program within the assigned country in conjunction with country counterparts, and the regional Commander-in-Chief (CINC) of the Unified Command; Office of the Joint Chiefs of Staff (JCS); Defense Security Cooperation Agency (DSCA), formerly known as Defense Security Assistance Agency (DSAA); and the US Military Department (MilDep). DSCA is the agency that performs administrative management and program planning. [Ref. 1] Basically there are many agencies involved in ensuring that the recipient country receives the defense articles and services and that the US Government's interest is served with respect to US National Defense and US industry protection.

Foreign military sales have a variety of complexities. A foreign government as well as the USG is always cautious about buying and selling military equipment. Many incentives have to be offered if one government is to buy military equipment and services from another government.

In dealing with a foreign country, it is important to realize that the sovereign foreign government is concerned with its independence and how it looks to its people and to the rest of the world. This should never be underestimated. No country wants to be viewed as a puppet of the United States. Though technologically superior in every way, a US contractor must be able to sell its equipment under the assumption that it is the best available (i.e. technologically superior, and reliable; a basic best value consideration) while not tied too closely to the US. At the same time, the US contractor needs to emphasize that it is US-made and therefore promotes a sense of US-foreign sovereign cooperation.

B. DIRECT COMMERCIAL SALES

The AECA allows the purchasing government or organization the choice of FMS or Direct Commercial Sales (DCS). There are benefits and risks to using DCS. A country purchasing a mature technology or having experienced acquisition professionals may choose DCS. DCS is a government or organization dealing directly with the US company vice going through the USG as in FMS. [Ref. 2]

Direct Commercial Sales are licensed under the Arms Export Control Act. DCS are an element of security assistance for Congressional oversight purposes. A direct commercial sale licensed under the AECA is a sale made by US industry directly to a foreign buyer. Unlike the procedures employed for FMS, direct commercial sales transactions are not administered by DoD and do not involve a government-to-government agreement. Rather, the US Governmental "control" procedure is accomplished through licensing by the Office of Defense Trade Control (ODTC) in the Department of State. The ODTC reviews all requests for licenses and other applications

to export defense articles, services or technical data; establishes licensing policies and procedures; and enforces compliance with the International Traffic in Arms Regulations (ITAR). [Ref. 2]

Eligible governments may request contract administration and contract audit functions normally provided by DoD contract administration offices and the Defense Contract Audit Agency (DCAA) auditors, with DCS purchases. The procedure is for the foreign customer to submit a request for such services to the Defense Contract Management Agency International, New York, which has been designated as the DoD Central Control Point and is responsible for arranging DCS contract administration and contract audit services. [Ref. 2]

C. ADVANTAGES AND DISADVANTAGES TO FMS

1. Advantages to the Customer

The advantages of FMS are that it provides government-to-government connections, offers control of classified material or munitions, allows the US to share information, allows for cooperative agreements, and improves interoperability with other countries. The main advantages of FMS, though, are that the US guarantees the work of the contract and the follow-on support. The US Government is involved in the acquisition of items or services and acts as a buffer between the foreign customer and US industry. The US Government ensures that the needs of the customer are met, despite cultural or communication differences, and also ensures that the item or training purchases are interoperable with the US military. [Ref. 5]

Another advantage is when a foreign country requests items using FMS, the US Government will furnish the items from its stock and resources, if available, or will

procure under terms and conditions consistent with the Department of Defense (DoD) regulations and procedures. When procuring for the foreign country, DoD will usually employ the same quality and audit procedures as would be used in procuring for the US, unless requested otherwise by the foreign customer. [Ref. 6]

2. Disadvantages to the Customer

Disadvantages to FMS are time and cost. Direct Commercial Sales (DCS) provide speed in purchasing. The FMS offices review each case, or purchase, which must be approved by many different departments during a process that may last up to six months. The bureaucratic red tape slows the process down [Ref. 5]. In DCS, all the customer really needs to do is identify a need and negotiate a price and a delivery time. The price is usually higher using FMS. Even though the foreign customer is afforded the same benefits and same protection as DoD procurement agencies, this does not mean that FMS prices are identical to prices for DoD domestic contracts. The contract prices for the same item are different between domestic purchases and FMS purchases [Ref. 6].

The key factor in the price differential is the application of "costs" which are allowable under FMS contracting, but may not be allowable under a domestic contract. The allowable costs are recognized as reasonable and allocable costs of doing business with a foreign government, although such costs might not be recognized when pricing domestic defense contracts [Ref. 6]. The reason for this is additional services, resulting in costs, which are being performed benefiting the foreign government. An example is translation of publications into another language [Ref. 6]. Also, when items are purchased through the Defense Logistics Agency (DLA), DLA puts a surcharge on the item to cover its overhead cost of purchasing, storing and maintaining the item [Ref. 8].

Some of the indirect costs may be avoided if the foreign customer purchases directly from the source, using DCS.

When selling a mature technology where costs are relatively well known and risk is generally neutral, there may be an advantage to the foreign customer to purchase using DCS. This is especially true if the company and the foreign customer have a procurement history. The writer is informed by Marine Corps Systems Command (MCSC) that sometimes foreign customers will request price and availability data (P&A), which is a rough order of magnitude data. Foreign customers want to get a rough idea of how much it will cost, for a possible FMS order. The foreign country then directly contacts a commercial company for a DCS purchase, basically comparative shopping. The Marine Corps quickly drops out of communication with foreign countries in such a case to prevent comparison shopping [Ref. 7]. It is DCS, FMS or a hybrid of the two; the country is discouraged from playing one against the other.

There can be a hybrid of DCS and FMS, providing the customer the advantages of both options. An example is the Marine Corps development of an anti-tank weapon, the Predator. The United Kingdom (UK) is interested in a similar weapon and is looking to the US and another country as the possible supplier. Through FMS, the UK obtains testing information with the Marine Corps. If the UK chooses Predator, it will enter into joint development with the US for cost sharing. Part of the system will be provided to the UK through FMS, and part through DCS. [Ref. 5]

The US DoD is neutral on whether a government chooses FMS or DCS. In either case, the US industrial base benefits, expanding their markets beyond the monopsony, or single customer, that most defense firms have. This can only improve the financial well

being of the US industrial base and at the same time extend the warm production base, benefiting both contractor and DoD.

D. OFFSETS

The Defense Acquisition Deskbook (DAD) defines offsets as an agreement of one of various industrial and commercial compensation practices required of defense contractors by foreign governments as a condition for the purchase of defense articles/services in either government-to-government or direct commercial sales. The responsibility for negotiating the offset arrangements resides with the US firm involved. The USG does not discourage offsets. The US recognizes that this is the price for conducting business overseas.

A major concern that a foreign country may have with purchasing a major system from the US is the inherent need to maintain employment and quality of life in its own country. Purchasing from the US means money is leaving the foreign country even though there is a benefit for their national defense. This may be very politically risky. Many nations have an offset program written into their contracts where a foreign contractor agrees to purchase local commodities and services or render technical assistance to encourage industrial growth. It is an agreement that, "I'll scratch your back, if you'll scratch mine." [Ref. 3:p. 27]

Offset activities may be grouped into the following:

- Coproduction and subcontracting. Coproduction is defined as a program implemented by a government-to-government or commercial licensing arrangement which enables a foreign government or firm to acquire the "know-how" to manufacture or assemble, repair, maintain and operate, in whole or in part, a defense item. Subcontracting is a contract or contractual action entered into by a prime contractor or subcontractor for

the purpose of obtaining supplies, materials, equipment, or services under a prime contract. [Ref. 9]

Coproduction or subcontracting within the foreign country might be required by the contract. A US company wishing to do business with a foreign country may find it necessary to enter into such an arrangement.

- Technology transfers. Technology transfers could occur when a technologically advanced US item is provided to a foreign country for production.
- In-country procurements. In-country procurements are when some of the US system is subcontracted out to local vendors or parts are procured from local vendors. Contracts will sometimes specify the percentage of a system that must be locally produced.
- Financial assistance and marketing assistance. Financial assistance is when a US contractor assists the purchasing country's business sector with loans, investments or joint ventures. Marketing assistance occurs when the US contractor provides a guarantee of future business with the country involved.

Offset Activities may fall into more than one category. [Ref. 10:pp. 4-10] For the purpose of this thesis, the majority of offsets are in two main categories: direct or indirect. Direct offset is tightly linked to the military procurement itself; it involves the transfer of military technology, usually by granting license to the receiving country to manufacture a US weapon system, its components or sub-components. A few examples of direct offset:

- A US prime contractor transfers military technology to the offset country with the purchase of a sophisticated fighter aircraft
- A US prime contractor subcontracts with in-country suppliers
- A foreign subcontractor manufactures part of a US-made weapon system in the offset country

Indirect offset is not directly military-related; indirect offset involves the foreign country exporting an unrelated product through the US prime contractor into the selling

country or transferring unrelated commercial technology. A few examples of indirect offsets:

- The prime contractor exports grapes from the offset country to another country
- The prime contractor transfers commercial technology to the offset country
- The prime contractor runs advertisements in the US to help promote tourism in the offset country

All the offsets clearly benefit the offset country by broadening the offset country's opportunity for commerce. [Ref. 3:pp. 228-29 and Ref. 10:pp. 4-6]

Offsets contractually require the US prime contractor to expand the opportunity for commerce by the offset country. However, upon closer examination, the US contractor also benefits. The contractor establishes business relations with the offset country increasing corporate profits and positioning the company for further business opportunity.

Notwithstanding, the possibility of additional business, US defense firms would prefer generally not to be involved in offsets and just sell outright the system or service for a fixed price. Yet, companies are willing to enter into offset arrangements because it's the cost of doing business. One Sikorsky spokesman put it simply by stating, "Sixty percent of something is better than 100% of nothing." [Ref. 3]

From the perspective of the buyer, offsets are very attractive. The country gets a modern weapon system or service and access to a new technology, and/or improved employment opportunities. One possible drawback is that the per unit cost of a weapon system with offsets would be higher than without them. [Ref. 3] The company shifts the offset costs to the customer.

E. CHAPTER SUMMARY

This chapter has described some of the complexities of Foreign Military Sales. A contractor has many perceptions and issues to deal with before entering into FMS or DCS with the US or US firms. This is a very political arena. Every nation must be concerned with defense, and wants technically advanced weapons. Also, every nation is sovereign and wants to at least appear to be able to defend itself without help from another. The USG and US contractors must balance technology, economies of scale and the US military's history and presence to aid in selling overseas with respect and sensitivity toward our international neighbors.

The clearest incentive for the United States to sell its equipment to foreign governments via FMS or DCS is to maintain the industrial base and improve economies of scale for its purchases. Many US defense manufacturers need more foreign business to ensure profitability and survivability. Foreign sales lowers cost of production, increases returns on research and development, and offset declining business [Ref. 11:p. 78]. The defense manufacturers continue to stay in business and the production lines continue to function. If the production line would become idle, then the company would have to lay off workers or manufacture something else. Either way, the in-house knowledge and skill of providing defense articles could be lost. The designing and manufacturing engineers would move to competing enterprises, or even work for foreign arms producers. In a time of war, where the strength of the industrial base and its ability to surge and mass-produce equipment for war could mean defeat and even the sovereignty of the nation could be at stake.

The more an item is produced the lower the cost because of economics of scale. For every eight F-18 aircraft sold overseas, the US gets one free [Ref. 12]. As the production line produces more of an item, the overhead costs are spread over a greater range. In the era of lower defense budgets, more frequent operations and obligations, the lower the cost the more the US DoD can buy for its money. Maintaining the domestic industrial base, improving profits for US corporations and lowering the costs of procurements are all clear incentives to sell US articles and services overseas.

The company is motivated by more than the current sale for doing business in a certain country. A contractor can establish a relationship with the foreign government, basically gaining a foothold into a new market. For example, Lockheed Marti could sell missiles to China. If the missile worked well and was reliable, China could consider Lockheed Martin a trustworthy corporation. Lockheed Martin then approaches the Chinese Government and asks if they could sell a consumer item to its population. China agrees and Lockheed Martin now has revenue from the missile sales and also access to China's population of 1.32 billion people for consumer items. A contractor by just gaining the confidence of a foreign nation could exponentially increase its revenue.

Technology exchange is good and bad. It is important to remember that a friend today may be a foe tomorrow. If cutting-edge technology gets into the hands of our enemy, many Americans may perish. One of America's greatest advantages is technology and staying on the forefront of technology. These technology exchanges help foster better relations with our allies and improve interoperability. As the US ensures that our allies are equipped with the most up-to-date weapon systems in the world, it is

less likely that they will need US assistance in a short conflict. Also, it will ensure US allies stay US allies because of the associated benefits.

Trade benefits the nations involved, whether it is military equipment or grapes. Selling US military equipment and services overseas opens many opportunities to establish national relationships and commercial partnerships. Trade builds relationships and relationships build trust.

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III. AMPHIBIOUS ASSAULT VEHICLE

A. HISTORICAL ANALYSIS

1. History of the AAV7A1

In March 1964, the United States Marine Corps issued a requirement for a new LVT (Landing Vehicle, Tracked) to replace the LVT5 (used in the 1950's and 1960's, model 5) and, after evaluating a number of proposals, a contract for the development of a new LVT was awarded to the then Ordinance Division of the FMC Corporation. In January 1994, FMC's Defense Systems Group (which included the Ground Systems Division) and BMY's Combat Systems Division formed a new joint venture company called United Defense Limited Partnership (UDLP, or United Defense). United Defense became a private company in 1997 when the Carlyle Group purchased the defense interest of the FMC Corporation and the Harsco Corporation. [Ref. 13]

The first production vehicles, which were designated the LVTP7 (Landing Vehicle, Tracked, Personnel, Model 7) were handed over to the United States Marine Corps in August 1971 and the first unit equipped (FUE) occurred in March 1972. Final deliveries were made in September 1974 after which the LVTP5 and its variants (1950's vintage) were phased out of service. In 1985, the US Marine Corps changed the designation of the LVTP7A1 (A1 on the end of the model number means some changes and upgrades have been made to the original design) to the Amphibious Assault Vehicle Personnel Model 7 Version A1 (AAVP7A1) without changing the configuration. All new production vehicles were built to the AAV7A1 configuration and all existing US

Marine vehicles that were not A1 versions were upgraded to the new production standard. [Ref. 13]

The AAV7A1 is expected to be replaced beginning in 2006 when the Advanced Amphibious Assault Vehicle (AAAV) is slated to reach Initial Operational Capability (IOC). Final Operational Capability (FOC) for the AAAV is planned for in 2013. To enable the current AAV7A1 to remain in operation through the year 2013, the Marine Corps has established the RAM/RS (Reliability, Availability and Maintainability/Rebuild to Standard) program, covered in detail later in this chapter. [Ref. 14]

The AAV7A1 and several versions of the LVT have been sold to many countries. In 1972, the Italian Marine Corps purchased 25 LVT7s via the MAP (Military Assistance Program). Italy is currently working out a co-production agreement with United Defense that will include 9 RAM/RS AAV7A1s and an up-grade of the LVTs to the AAV7A1 standard. In April 1995, through the Marine Corps Systems Command, United Defense received a firm-fixed price contract for a total of 14 AAV7A1 Assault Amphibious Vehicles for the Brazilian Marines under the Foreign Military Sales Program. In late 1995, United Defense and Samsung Aerospace of South Korea signed a major direct sales contract with the Republic of Korea to co-produce a total of 57 AAV7A1 vehicles in three versions between 1996 and the year 2001. In September 1997, United Defense entered into a \$40 million direct sales contract with Spain to rebuild AAV7 vehicles for the Spanish Marines that had been originally purchased between 1972 and 1974. The vehicles were upgraded to the AAV7A1 standard. United Defense subcontracted with a Spanish contractor to do the work in Spain. The contract with United Defense and Spain also covers technology transfers, tools and spare parts. [Ref. 13]

The following figure describes the countries that had purchased, prior to 2000, amphibious vehicles from the United States and which variants were purchased. They are listed by variant and vehicle. There are three different variants P, C, and R. The Personnel variant, AAV7PA1, is a troop carrier and can carry 17-21 combat equipped troops. The Command variant, AAVC7A1, carries extensive communications capability. The Recovery variant, AAVR7A1, enables vehicle recovery and maintenance functions; it has a complete maintenance shop capability.

| | LVT7 | | | | AAV7A1 | | | |
|-----------------------|-----------|---------|----------|------|-----------|---------|----------|-------|
| | Personnel | Command | Recovery | otal | Personnel | Command | Recovery | Total |
| USA | 0 | 0 | 0 | 0 | 1,151 | 106 | 64 | 1,321 |
| Argentina | 19 | 1 | 1 | 21 | 0 | 0 | 0 | 0 |
| Brazil | 0 | 0 | 0 | 0 | 22) | 2 | 2 | 26 |
| Italy (A) | 24 | 1 | 0 | 25 | 0 | 0 | 0 | 0 |
| | | | | | 9* | | | 9* |
| Republic of Korea (B) | 53 | 5 | 3 | 61 | 41 | 1 | 0 | 42 |
| | | | | | 54** | 2** | 1** | 57** |
| | | | | | 67** | | | 67** |
| | | | | | | | | 166 |
| Spain (C) | | | | | 16 | 2 | 1 | 19 |
| Thailand | 12 | 0 | 0 | 12 | 18 | 2 | 1 | 21 |
| Venezuela | 9 | 1 | 1 | 11 | 0 | 0 | 0 | 0 |
| Total | 117 | 8 | 5 | 130 | 1,248 | 113 | 68 | 1,429 |

(A) Italian LVT7s are being upgraded to AAV7A1 RAM/RS configuration along w/ the 9 AAV7A1 RAM/RS's being co-produced by United Defense & Italy. (*) Italian production has not started, thus annotated separately.

(B) (**) Korea's totals include the 42 previously purchased, plus the 57 AAV7A1s currently being co-produced w/ United Defense, and the additional 67 AAV7A1s planned to be co-produced by United Defense & SAMSUNG. The U.S. Marine Corps sold the technical data package (TDP) to Korea for co-producing these AAV7A1s, which total 124 (57 + 67 = 124).

(C) Spain's 19 LVT7s were upgraded to AAV7A1 via a DCS arrangement between United Defense & Spain. This effort was completed in 1999.

ADDITIONAL NOTES:

- ◆ All LVT transactions were via the Military Assistance Program (MAP), i.e., grant aid at no cost to the buying country.
- ◆ All AAV7A1 transactions were via the FMS process, except for those noted above as co-production arrangements (i.e., Korea & Italy, and Spain's upgrade, which are all DCS).

Figure 1. Amphibious Vehicles By Country. After Refs [13 and 15]

2. RAM/RS Program

The RAM/RS program is the latest and probably the final upgrade to the AAV7A1.

Many systems on the AAV7A1 are reaching the end of their useful life and will require replacement. Marine Corps Systems Command determined that instead of Inspect and Repair Only as Necessary (IROAN), the next cycle of AAV7A1 depot maintenance action would more appropriately be a Rebuild to Standard. [Ref. 14]

RAM/RS (Reliability, Availability, Maintainability/ Rebuild to Standard) program grew out of the IROAN program. In the mid 1990s, after many years of IROAN maintenance fleet planners saw the need for a formal system upgrade. There was a need to maintain the AAV7A1 fleet to bridge the time gap before the new AAV would be fielded. RAM/RS grew out of that need. [Ref. 14]

The Marine Corps Commandant approved the RAM/RS program in June 1997. The program focuses on reducing total ownership costs by using greater than 90% commonality of parts with the Army's fleet of more than 5,000 Bradley vehicles. This enhances the Marine Corps logistic capability, permits higher volume procurements of sub-systems, provides "economies" of parts procurement, and revitalizes a vendor base for supporting the platform. The rebuild to standard portion was specifically tailored to address fleet problems. Several upgrades had added weight, which caused the AAV7A1 to become slower in the water and on land. The upgrades had used parts that were unique to the AAV7A1. The RAM/RS program addresses these concerns by adding improved suspension and power train and improving the overall maintainability of the vehicle. The RAM/RS program includes 680 of the 1321 AAV7A1 vehicles in the USMC inventory.

The RAM/RS commenced in 1999 and is scheduled to modify 170 vehicles per year.
[Ref. 16]

3. The Need for the AAV

It important to understand the US need for the AAV because this is the Marine Corps' amphibious vehicle of the future. This section will explain why a US allied country might be interested in the AAV and the doctrine change it supports.

The Marine Corps is developing a modern amphibious vehicle that will support a change in doctrine. The new doctrine is called Operational Maneuver From the Sea (OMFTS). U.S. Allies are an integral part of the doctrine and it is highly unlikely that the U.S. will be involved in a military conflict without allied participation. Their ability to participate alongside U.S. Forces in the future means that allies need also to develop similar doctrine. The U.S. will have difficulty operating jointly with allied nations if they adhere to different tactics and doctrine.

OMFTS is a Naval concept developed by the Marine Corps in concert with the Navy. In OMFTS, Naval forces focus on an operational objective using the sea as maneuver space to generate overwhelming tempo and momentum against critical enemy vulnerabilities. OMFTS requires overcoming challenges in battlespace mobility, intelligence, command, control, and sustainment. [Ref. 16]

In the 1980's, the Navy and Marine Corps developed a concept of over the horizon (OTH) assaults to avoid enemy strengths, exploit enemy weaknesses, and protect Navy ships from increased land based missile threats and sea based mine threats. This concept has matured into the OMFTS concept. The AAV, together with the MV-22 Osprey tiltrotor aircraft and the Landing Craft Air Cushion (LCAC), will provide the

tactical mobility required to spearhead OMFTS. [Ref. 16] The Marine Corps believes that these three warfighting systems are critical to the OMFTS concept.

The AAV will allow immediate, high-speed surface maneuver of Marine infantry units as they emerge from ships located over the visual horizon 25 miles and beyond. Operations will be conducted in a manner that protects the Marine and Naval forces, exploits the intervening sea and land terrain to achieve surprise and rapidly penetrate weak points in the enemy's littoral defenses to seize operational objectives [Ref. n16]. The current versions of the AAV7A1 do not have this ability. Further improvements (e.g. RAM/RS) to the AAV7A1 cannot attain the desired end state of capability. In simple terms, the AAV7A1 cannot meet the requirements to fulfill the new doctrine.

In August 1999, the AAV program began prototype contractor shakeout testing, with developmental testing and early operational testing conducted concurrently. Under the current schedule, full rate production will begin and Initial Operational Capability (IOC) will be achieved in Fiscal Year 2006. The USMC plans to buy a total of 1013 AAV's. Full Operational Capability is scheduled for Fiscal Year 2013 [Ref. 16]. By 2013, our allies must decide whether they will purchase the AAV and participate with the United States in the OMFTS concept. Beyond that time the production line will go cold and the cost of restarting a cold line may be too much to bear.

B. BUSINESS PARTNERSHIP AGREEMENT (BPA)

1. Background on the BPA

The BPA is important to the reader because it offers a hybrid option between FMS and DCS. The benefits associated with FMS are incurred with a DCS sale.

The Business Partnership Agreement (BPA) is a proposal that would join the USMC and United Defense in a common venture. The purpose of the partnership is to upgrade the AAV7A1 to the RAM/RS standard and to 'sell' to allied countries the AAV7A1s that are above the Marine Corps requirement. On 28 October 1999, United Defense provided a written proposal to the Marine Corps to provide exchange allowance for nine AAV7A1 hulls from stock in support of their efforts to sell the AAV7A1 to Italy. The new approach was to include the USMC, United Defense, subcontractors such as Cummings, and the Defense Logistic Agency (DLA) in a partnership. No one in the partnership would be the majority owner. [Ref. 17]

The BPA envisions converting Marine Corps AAV7A1s to AAV7A1 RAM/RS in support of foreign sales. [Ref. 17]

The Marine Corps has a total of 1,321 Assault Amphibian Vehicles (AAV7A1) in its inventory, but an Approved Authorization Objective (AAO) of 1,057. That means that the Marine Corps has 264 AAV7A1s over AAO that could potentially be offered up for foreign sales. Currently, there is only funding for 680 AAV7A1s to undergo the RAM/RS upgrade, 377 would not be RAM/RS [Ref. 17]. With limited funding, the Marine Corps will upgrade only the AAV7A1s in the Assault Amphibian Battalions unless more funding becomes available. [Ref. 18]

2. Benefit to the Marine Corps

Benefits are important for the reader to understand for this is the Marine Corps' motivation for getting involved in the BPA. Without this incentive there will be no agreement.

There is only funding for 680 AAV7A1s to undergo the RAM/RS upgrade, and the remaining 377 are not funded for RAM/RS upgrades. The Marine Corps intends to sell the remaining 264 AAV7A1s under FMS and/or credit the unsold FMS AAV7A1s to United Defense.

The Marine Corps Requirements Oversight Committee (MROC), chaired by the Assistant Commandant of the Marine Corps, stated that the proceeds from any AAV7A1 sales under FMS Replacement With Improved (RWI) procedures would go to the AAV. [Ref. 15]

An Amphibious Vehicles International Business Strategy (AVIBS) study was conducted by MARCORSYSCOM in 1999. Several important recommendations of that study were: (1) that the AAV be sold via FMS only, (2) that AAV7A1 (RAM/RS) would be available only via the USMC (incurring FMS), and (3) that FMS Replacement With Improved (RWI) procedures be followed in an attempt to get the proceeds of any AAV7A1 or RAM/RS sales returned to the USMC. The AVIBS study was briefed to the MROC in the first half of Fiscal Year 00. [Ref. 15]

In 1999, United Defense was selected and became the sole source provider of RAM/RS upgrades on the AAV7A1 [Ref. 7]. The Marine Corps is deciding to move a step further with not just United Defense, but other companies that have been selected as sole source providers (e.g. Cummings, producer of the AAV engine). The Business Partnership Agreement (BPA) has evolved into choosing a company through competitive selection, making it the sole source provider for all future sales, and working with that company for all upgrades, future production and technology innovation. BPA would then be a joint venture where the Marine Corps and associated companies have a shared vision

of the future with respect to production and sales. A final definition of the BPA will come forth once the Marine Corps has officially approved the BPA.

3. Benefit to United Defense

United Defense is already benefiting from its agreement with the Marine Corps. The RAM/RS program is to exceed \$40 million [Ref. 19]. As part of the partnership United Defense is the sole source provider for all future FMS sales of the AAV7A1 and all upgrades [Ref. 20] to customers such as Spain and Brazil where sales are likely [Ref. 21]. United Defense will obtain increased business and profits addressing all USMC AAV7A1 inventory, and a long-term relationship with the Government.

United Defense gains an advantage by easing possible apprehensions of potential customers who, in the past, have only dealt with the US Government. The customer gets benefits of DCS and the comfort of the USMC standing beside the product. Once the AAV is fielded, the AAV7A1s will be phased out and United Defense will be given the opportunity to sell AAV7A1s to international customers in greater numbers without the need to open a production line.

United Defense benefits:

- Complete access to the AAV7A1s
- Access to the Government supply system and components with equal priority
- Work directly with all associated technical manuals
- USMC will back the company when and where needed
- The Marine Corps will share all information concerning Engineering Change Proposals (ECPs) and problems incurred with the vehicle [Ref. 22]

4. Technical Data Rights

It is important for the reader to understand who owns the technical data rights. The US Government can sell the rights to a country or business for use. A country or business cannot use, sell or produce with intent to sell to another country the technical data rights without the consent of the holder of the rights.

The ownership of technical data rights is as follows:

- Pre-1984 -FMC owned all technical data rights
- 1984 – 1987 - United Defense owns the technical data rights
- 1987 – 1994 -Many different companies contributed to the ECPs and USMC reserved the rights to all technical data
- 1994 – present The Marine Corps owns the technical data rights. This is basically the RAM/RS program [Ref. 18]

The Marine Corps owns the rights to the AAV7A1 RAM/RS and AAV7A1 program and the use of those rights must come through the USMC. United Defense needs the RAM/RS program in order to modernize and upgrade the AAV7A1s currently in use overseas. The use and ownership of the technical data package is one of the major areas of negotiations that have delayed the signing of the BPA. Generally, it is agreed that United Defense can build the vehicle configuration up to 1987. (i.e., AAV7) [Ref. 15]

C. FUTURE AAAV SALES

Concerning the future, the reader must understand that the US Marine Corps is moving forward with the AAAV and the OMFTS concept. As described earlier in this chapter, some of the US allies are likely to change their doctrine to be consistent with OMFTS. Those allies are the focus for the predictive model.

The AAV will be available via FMS only, and full rate production is not expected until 2006. The Marine Corps has been marketing the AAV for over a year now. The USMC would prefer to have FMS customers participate in production as early as possible in full rate production. This would reduce the unit cost and learning curve costs. In fact, a recent study revealed that if 50 units were sold via FMS in the first year, for every five AAVs sold, the USMC would get one AAV free. The price tag, at roughly \$5 million a copy, does make a lot of customers nervous. However, there are a few interested countries that can afford them. Taiwan has received enough AAV briefings and information that they have a general idea as to what the AAV will cost them. Japan and Korea have also shown some interest [Ref. 15]. The major problem that is being faced is the cost. It will be very difficult for a country to commit to a large procurement roughly several years in advance. As of yet, no countries have made any concrete requests for the AAV.

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IV. FACTORS THAT INFLUENCE DEFENSE SALES

A. INTRODUCTION

According to the *New York Times*, International arms sales surged to \$30.3 billion (US) in 1999, as the United States solidified its position as the world's biggest arms dealer. American contractors sold nearly \$11.8 billion in weapon sales in 1999, which was more than a third of the world's total and more than all European countries combined [Ref. 23]. According to the *London Daily Telegraph*, the United States increased its market share to 49.1 percent of the arms suppliers in 1999. Britain followed with 18.7 percent, and France, with 12.4 percent. Russia, benefiting from a devalued ruble, was in fourth place, with 6.6 per cent [Ref. 24]. The exact percentage of US market share might be in question, but the underlining theme that the US dominates weapon sales remains unchallenged, although there may be growing competition among arms suppliers in the years ahead. Many countries are eager to protect their own defense industries, yet are unlikely to turn to the international market. However, the United States has an advantage over other international sellers, since previous American sales often result in repeat customers. "There are very few big sales out there, but for the last 25 years, the US has developed relationships with so many countries that now, even though it's a very difficult market, we have a competitive advantage in selling spare parts and support services," said Dr Richard F. Grimmett, an analyst for the Congressional Research Service who wrote a report on the subject that was delivered to Congress in the summer of 2000. [Ref. 23]

In a related article, it was announced that the US will maintain its role as a major defense supplier to Greece as that country continues efforts to update its forces [Ref. 25].

Secretary of Defense William S. Cohen said in an October 2000 joint press conference with the Greek Minister of Defense Akis Tsohatzopoulos in Thessalonike, Greece.

Greece is in the process of modernizing its forces, as all NATO allies are striving to improve their defense capabilities. I must say that I am very pleased that Greece is continuing to look to the United States as a major supplier of its modernization needs. [Ref. 25]

Cohen explained that in a 1999 summit in Washington, NATO members decided they had to address weapon system deficiencies that had been identified during the conflict in Kosovo. NATO members are in the process of identifying their requirements to meet those deficiencies. [Ref. 25]

The United States "remains a very strong competitor, indeed a supplier, of these modern needs for Greece and other countries," Cohen said. "We compete, and we believe that we have the best products at the best price...But I think that our relationship focuses upon the need for interoperability, which is key for effective action on the part of NATO and EU (European Union) members." [Ref. 25]

Interoperability is major benefit of FMS. Being able to communicate and work together using similar equipment and reducing duplication of maintenance support is a major benefit of interoperability.

B. ITALY

1. FMS of Amphibious Vehicles and Support

The Government of Italy currently has 25 Landing Vehicles Tracked (LVT7s), consisting of 24 LVTP7 Personnel carriers and one LVTC7 Command vehicle. These LVT7s were delivered to Italy in the early 1970s under the Military Assistance Program (MAP). No support was delivered under this program. The MAP program usually does not come with support since the program requires no funding from the receiving country. [Ref. 18] Currently, Italy is a cash-paying customer without US Government assistance in military procurement. [Ref. 26] If Italy wanted to attain support for the LVTP7, it would have to arrange a separate support package. As far as this writer's research has determined, no support was requested or delivered by either United Defense or the United States. [Refs. 22 and 26]

The Government of Italy is interested in upgrading their amphibious vehicles, as well as procuring additional new vehicles. United Defense plans to sell Italy nine AAV7A1 (RAM/RS) vehicles on a direct commercial basis, which would bring their total to 34 vehicles. The proposal includes the outfitting of USMC AAV hulls with all new components. United Defense also plans to share the work with Italy through a kit installation program. [Ref. 18] As of this writing, production has not started. Share of work is like an offset in this context. Instead of agreeing to buy a specific percentage of the contract's value, a percentage of the work is subcontracted out to an Italian company. This is done to ensure passage through Italian Parliament, or to secure partial and/or complete funding via the Italian Ministry of Industrial Affairs budget. [Ref. 26]

It is believed that Italy has been repairing and maintaining their vehicles indigenously [Ref. 18]. Italian law contains protectionist requirements for buying foreign products, similar to the US "Buy American Act," which requires the US Government to consider US companies before foreign companies are considered. The fact that Italy did not seek logistic support for the LVT7s stems from a number of reasons listed below: [Ref. 26]

- Indigenous capability
- A source of much needed jobs
- Paucity of funds for outside logistics
- A means to secure Parliamentary support

The latest United Defense efforts with Italy may result in an increased ability to support the vehicles within their own country. Italy's plan to replenish spare parts for the new vehicles is not known at this time. It is anticipated that they will develop a long-term relationship with United Defense for direct commercial support. If United Defense delivers a configuration consistent with that of the USMC, it will also be possible for Italy to utilize FMS for follow-on support. [Ref. 18] More likely, Italy will continue using Direct Commercial Sales (DCS) for the resupply of spares. DCS can come in many forms in Italy: third party sales, licensed sales in-country, and a licensed indigenous company producing parts within Italy for sale commercially to their government. [Ref. 26]

FMS is not the preferred method of procurement in Italy. The Italians do not want to tie up money in the FMS program unless it is necessary. Three examples of potential FMS use are as follows, (1) a sensitive, technically complex item; (2) in order to

get an item that is in production sooner rather than later (taking advantage of another country's volume production); or (3) in the case of national security [Ref. 27]. Italians would like a co-production type arrangement where they could not completely produce an item on their own. Italy prefers to produce within their country and will pay the higher price just to ensure that the product is produced in-country by their citizens. There is no record of a technical data transfer for the AAV for Italy to produce spare parts within their country. It was stated earlier that Italians prefer indigenous production; it then should be clarified that it is possible that Italy is producing the spare parts indigenously or procuring the parts from another source, other than United Defense. [Ref. 18]

According to Commander Michael R. Pease, USN Office of Defense Cooperation
United States Embassy, Rome:

DCS is much more responsive than FMS, and the incentives are much better aligned to support the end user. It is not the 2.5% FMS admin fee that countries object to, it is that dealing with FMS adds a huge layer of red tape, delays and risks. There is little incentive for US services to spend the time, effort and money to support a lot of diverse, small order quantity accounts on behalf of other countries—where's the benefit to USN or USMC? FMS has limited utility. [Ref. 26]

Commander Pease's position is that there is no incentive for the US to become more efficient in regards to small value orders of FMS sales. The lack of efficiency in FMS provides incentives for the customer to choose DCS over FMS.

In a related matter, FMS is still being utilized. The Italian government has requested a purchase of 50 SM-2 Block IIIA Standard missiles, via FMS, with weapon system components, including spare and repair parts, support, training, US Government

and contractor technical assistance and other related elements of logistics support. The estimated cost is \$135 million (US). This proposed sale will contribute to the foreign policy and national security objectives of the United States by improving the military capabilities of Italy and further weapon system standardization and interoperability with US forces. [Ref. 28] Generally, FMS works fairly well in the areas of training, and those items where that can “piggy back” onto a large production run by a US service customer. [Ref. 26] As noted earlier, FMS may be utilized in the purchase of technically complex items or when the Italian government deems it critical to national security.

The Italian Navy has shown a very strong interest in buying the AAV as well as LCAC but currently does not have the funding [Ref. 29]. This is mentioned to remind the reader that AAV will only be sold via FMS and to suggest that Italy is considering following the US Marine Corps concept of Operational Maneuver From The Sea (OMFTS), which requires the AAV, LCAC and the MV-22 [Ref. 16].

Typically, Italy imposes a 50 percent offset on US contractors marketing weapon systems in Italy; however, the researcher could not confirm the presence of an offset agreement between Italy and the missile manufacturer [Ref. 28]. If Italy can get 100% offset, they will clearly try. Often Italy is successful in getting a higher offset percentage. The US C-130J sale to Italy was about 100% offset. As a policy, the US Government no longer discusses offsets; such deals are strictly between a private firm and the customer. [Ref. 26]

2. Italian Political Economic and Defense Status

Italy has a 1999 population of roughly 58 million and the unemployment rate remains at about 13 percent of the working-age population. A large national debt has

plagued Italy's economy. The national budget of Italy is in deficit spending at about 2.8% of GDP (1997), which is approximately \$26 billion (US). In keeping with provisions of the Maastricht Treaty, which created the European Union, Italy is attempting to reduce its budget deficit and has been moderately successful. [Ref. 26]

Italy has a parliamentary form of government. It has been a democratic republic since June 2, 1946, when the monarchy was abolished by popular referendum. The Italian Republic is now in its 57th government since 1945, the third in the current legislation period, which is currently in its fourth year. [Ref. 30]

According to Peter Weber an Italian political writer:

To bring down an Italian government seems in fact one of the most effortless moves in the world: indeed, a simple no-confidence vote in one of the chambers is enough and the prime minister is forced to step down. But usually it is not even necessary to go that far, the simple threat of such a move by only one of the many coalition partners can open a government crisis. [Ref. 30]

The researcher concluded that the elected officials are very sensitive to public opinion. Order is maintained through a well-established bureaucracy that supports the elected offices. [Ref. 31] Even though there have been many short-lived "governments," three during the last three years, there are no major modifications in the defense procurement policy during this period of change. [Ref. 26]

In 1998, the gross national product (GNP) was estimated at \$1.17 trillion (US), or about \$20,350 per capita and industry contributed 31 percent to the value of this domestic output. An ongoing problem of the Italian economy has been the slow growth of industrialization in the south. [Ref. 31]

In 1998, the Italian permanent armed forces totaled 265,500 people, with an army of 165,600, a navy of 38,000, an air force of 61,900, and a central staff. Compulsory military service for men extends for one year. [Ref. 30] Italy is in the near future eliminating the draft. It is moving toward a smaller, professional, armed forces. [Ref. 26]

The Italian Navy includes the San Marco Group, which is their version of the U.S. Marine Corps. It is built around a regimental size unit, similar to the US Army brigade. Each unit contains roughly 5000 people, one organic helicopter squadron and three LSTs. They are probably the most heavily employed unit in the Italian military. San Marco is totally volunteer. Currently, they are designated along with the Spanish Marines as part of the standing EURMARFOR amphibious unit. This unit is known as SIAF, Spanish Italian Amphibious Force. [Ref. 29]

There is also the Lagunari Regiment of the Italian Army, which specializes in amphibious and riverine operations. It uses USMC doctrine and has had limited training with the USMC. They use the AAV, LCM-6 boats as well as Zodiacs. They are about 2000 strong of which 85% are volunteer. This is important because most of the Italian military is conscript and, by law, conscripts are not allowed to deploy outside Italy. [Ref. 29]

Italy is a part of North Atlantic Treaty Organization (NATO) and the European Union (EU). Italy has no real threats to its sovereignty, as long as it remains a NATO member. [Pease] It borders on the Adriatic Sea near the Balkans area, which has become very unstable since the end of the Cold War in 1989. On May 19-20, 2000, Italy hosted the "Conference on Development and Security in the Adriatic and Ionian." The conference focused on the catalyst constituted by the countries in the region bordering a

common sea. The intention was overcoming the present problems and tensions that have multiplied in the area over the last few years as a consequence of the recurring and dramatic Balkan crises. The conference emphasized the opportunities offered by concerted action with a view to the future stability and development of the area. The emphasis was to promote stability in the area. The aim was enhancing regional cooperation as an effective instrument for fostering overall stability in the area, which coincides with an integrated and sub-regional approach that the European Union itself has recently adopted. [Ref. 32]

The bulk of the Italian maritime forces are arrayed along the Adriatic coast to try to stem the flood of Balkan immigration into Italy, and subsequently onto the rest of the EU. Italy's incentive for keeping the immigrants out of their country is internal stability. Italy has limited social outreach programs that could not withstand a large influx of welfare recipients. [Ref. 26]

B. BRAZIL

1. FMS of Amphibious Vehicles and Support

The Brazilian Marine Corps (BRMC) procured 14 Assault Amphibious Vehicles (12 AAVP7A1 Personnel, one AAVC7A1 Command and Control, and one AAVR7A1 Recovery) and associated support from the USMC under an FMS program. The vehicles and associated support were delivered on 12 May 1997. These vehicles complemented the initial 12 AAV7A1s delivered in the 1985 timeframe under FMS. These older model AAV7A1s included 10 AAVP7A1 Personnel carriers, one AAVC7A1 Command vehicle, and one AAVR7A1 Recovery vehicle. [Ref. 18] The total inventory of amphibious vehicles is 26.

When asked why Brazil has AAVs, Lieutenant Commander Peter Rabang, the Security Assistance Officer for Brazil, answered, "...because they have adapted various aspects of US amphibious doctrine." [Ref. 33] This is important because as the Marine Corps changes its doctrine, Brazil may follow suit.

After Brazil's purchase, the Marine Corps initiated the Reliability, Availability, Maintainability /Rebuild to Standard Program (RAM/RS) and Brazil was interested in upgrading to the RAM/RS standard their AAVs purchased in the '80's and 90's. A Rough Order of Magnitude cost estimate in the amount of \$42 million (US) was forwarded to Brazil, providing pricing data on the upgrade of all 26 Brazilian vehicles to the USMC RAM/RS configuration under FMS. This would have resolved their current problem of supporting two different configurations, as well as obsolescence problems with some of the components from the 1985 variants [Ref. 18], but the cost was too high at that time. In fact, the total cost was as much as the original AAV itself. Also, Brazil wanted to keep the support needs the same [Ref. 33]. RAM R/S would require different support than they were used to with the AAV variants that Brazil had acquired. Then Brazil looked at just purchasing the RAM/RS suspension system, which would require a complete dismantling of the vehicle. This was to be done by the US, but was also too expensive for the Brazilians. Brazil then considered upgrading the vehicle within their own country, indigenously, so MARCORSYSCOM traveled to Brazil for a site visit with the Brazilians. It was determined that the cost of set up and tooling would not justify the expense, due to the limited number of AAVs that would require the upgrades. The 26 vehicles would not provide economies of scale for such an action. The technical data rights for installing the suspension, themselves, was never really addressed. [Ref. 33]

The Brazilians produce in-country only when there are economies of scale. High use items are considered for manufacturing. Low use items are bought offshore. [Ref. 22]

When Brazil bought the AAV7A1 via FMS in 1997, it included a FMS support package [Ref. 33]. Initial support provided in the 1997 FMS procurement (14 vehicles) included an interim spares package (for two years), support and test equipment (one site), training, and publications. Brazil also procured additional spares to support all 26 vehicles [Ref. 18]. The Marine Corps has a formula that calculates parts usage for the kind of equipment operation anticipated by the country involved [Ref. 21]. United Defense offered support packages via direct commercial sales (DCS) and to by-pass FMS. Brazil declined the offer. The advantages of the DCS from United Defense were that parts would be received faster. The disadvantages were that in the case of Government furnished equipment, United Defense would be required to go through the US Government to get the parts. Brazil is buying some parts for the engine via DCS because the parts are readily available via commercial sources in-country. They are buying these parts directly from the local manufacturer's representative. [Ref. 33]

Follow-on support is being provided to Brazil through various Foreign Military Sales (FMS) cases, to include spares, repair parts, publications, ECP notifications, repair of repairables, and schoolhouse training in CONUS. The BRMC conducts most vehicle maintenance and repairs within their military but depot level maintenance is limited. For repair or fabrication of items of an industrial nature, the BRMC has used Brazilian industry. This also holds true for numerous parts required for sustaining ships acquired from the US. Brazil also obtains a limited amount of material and services support on a

direct commercial basis, usually from US companies or through a Brazilian representative who is affiliated with a US company [Ref. 18]. There are United Defense and Cummings (the AAV engine manufacturer) representatives in Brazil. There is also a Cummings plant in Brazil, where many of their engine parts are readily available. [Ref. 7]

Brazil supports the older version of the AAV via FMS support from the US. Brazil would like to upgrade the gun system on the older versions of the AAV to the newer up-gunned weapon system on their newer vehicles, but it is too expensive. [Ref. 33]

According to Lieutenant Commander Peter Rabang, the Security Assistance Officer for Brazil:

The Brazilians expect the AAV to last a long time. They would like to acquire technology and make things in-house where practical. This way they can gain the experience, technology and know-how for the future. When they acquire a piece of gear they want to know how to repair it themselves. [Ref. 33]

BRMC had problems with the warranty that they had for the 1997 procured AAVs. There was a misunderstanding as to who would pay for problems that developed after delivery. The USMC became involved and determined that in some cases Brazil was responsible and in others United Defense was responsible. The Marine Corps solution was to send a joint USMC and United Defense Technical Assistance Team to Brazil with some mechanics and operators to show the Brazilians how to fix the problems themselves. USMC also went in as arbitrators. After arbitration, United Defense did fix some non-warranty items. Yet there were some problems that United Defense would not fix which Brazil could not fix themselves, so the Marines performed the maintenance

[Ref. 18]. Because the Marine Corps helped out when the Brazilians really needed it, Brazil really feels that they could depend on the US Marine Corps [Ref. 7]. Brazil thought that they had gotten burned by United Defense [Ref. 18]. This was an FMS sale.

The problems that Brazil incurred were not entirely the fault of United Defense. Brazil had not purchased a support package that would provide training and publications on how to maintain and operate the vehicles. Brazil had already been operating the AAV7 for several years. The Marine Corps was adamant about Brazil needing the training with the purchase of the 14 vehicles, which would be included in the FMS case. However, Brazil refused [Ref. 18].

FMS sales to Brazil contributed to the foreign policy and national security of the United States by helping to improve the security of a friendly ally that has been and continues to be an important force for political stability and economic progress in South America. [Ref. 34]

2. Brazilian Political, Economic and Defense Status

Brazil has a population of roughly 174 million people. The unemployment rate in Brazil is around 7% but many of those considered employed are actually part-time workers. Brazil ended military rule in 1985 and currently has a democracy. In the recent past it has had extremely high inflation rates, which reached a peak of more than 1,500 percent a year in 1991. A corruption scandal also badly damaged the government. In 1992, legislative investigations uncovered an influence peddling scheme that involved hundreds of millions of dollars and implicated the President; he was later impeached. Under a new President, inflation dropped from a rate of 45 to 50 percent per month in early 1994, to a rate of about 1 to 2 percent per month over the next two years, giving

Brazilians their lowest inflation rates in decades. In 1995, legislation on federal expenditures dramatically reduced government involvement in the economy. The government privatized major state enterprises, broke up the government-controlled telecommunications monopoly, and eliminated restrictions limiting the amount of money foreign corporations could invest in Brazil. [Ref. 35]

Brazil's GNP was \$768 billion (US) in 1998; per capita was \$4,700. [Ref. 36]

The manufacturing sector has been a key to Brazil's economic development. A major objective of Brazil's industrialization policy was to replace imported manufactured goods with Brazilian-made goods. As a result, industry has become highly diversified, including a range of high technology and heavy industries. Industrialization has involved a mixed pattern of investment by domestic capital; by the government in areas such as steel, petrochemicals, and aircraft; and by foreign capital in the manufacture of automobiles, chemicals, and electrical goods. As a result, Brazil is one of the world's major steel producers and car manufacturers. [Ref. 35]

The army is the largest military force, and almost 60 percent of its members are drafted. Men between the ages of 18 and 45 must serve a compulsory tour of duty ranging from 12 to 18 months. The navy and the air force have lower proportions of draftees. There is also a paramilitary public security force and a large military reserve. The army has a total of 337,800 active-duty with 133,500 are conscripts; the navy has a total of 58,400 active with 2,000 conscripts; 15,000 of the Naval personnel are Marines; the air force has a total of 59,400 on active-duty with 5,000 conscripts. The military ruled the government prior to 1985, maintaining good relations with neighboring countries, and little internal political violence. Since then, the role of the armed forces

has been diminishing. A new ministry of defense was created in 1999, the army, navy and air force is under one civilian Minister, ending a long tradition of three separate military ministers in control of the armed forces. Secretary of Defense William Cohen noted, "Brazil now has for the first time a Minister of Defense. On past trips I had to visit with each of the heads of the military." Now Secretary Cohen meets with just one minister making planning and execution of joint training easier. [Ref. 37] Brazilian defense currently absorbs 3.1 percent of the government's expenditure, falling from 4 percent under the military regime. [Ref. 35] This is about 1.7 percent of the Brazil's GNP [Ref. 33].

According to Lieutenant Commander Peter Rabang, the Security Assistance Officer for Brazil:

The Ministry of Defense for Brazil is trying to work out supply logistics similar to the United States' DLA, but is not there yet and the services are not yet consolidated. Currently all services procure their own parts. There initially was a lot of resistance to the consolidation, but government remains stable.

Brazil has no serious threats to their territories. They are just concerned, like every other country, about protecting their sovereignty. [Ref. 33]

Remarks as Prepared for Delivery by Secretary of Defense William S. Cohen,
Manaus, Brazil, Tuesday, October 17, 2000:

I hope we can bring a continued spirit of cooperation to the challenges now facing our friend, Colombia, where the drug trade, insurgency, and paramilitary forces threaten one of South America's oldest democracies and stable economies. The US is concerned that the "spillover" of those problems to neighboring states, which has been increasing in recent years, will only worsen if we do nothing. Working together, we hope to help Colombia in their time of need and prevent the conflict from shifting Colombia's problems to its neighbors. [Ref. 37]

Brazil is one of Colombia's neighbors. Economic growth and increasing security concerns with drug trafficking in the northeast are likely to spur rising procurement. A concerted effort is underway to upgrade armed forces in critical areas. The military is beginning to enhance mobility, attain reasonably high-technology forces and maintain parity in terms of strike forces with those of other regional powers. Within the limits of the present economic situation, Brazil is determined to upgrade its armed forces to a level consistent with the country's regional and global importance. [Ref. 19]

Brazil is a member of the Organization of American States (OAS). OAS facilitates cooperation between member countries on matters of security and economic and social development. Membership includes all 35 nations in the western hemisphere excluding only Cuba.

C. REPUBLIC OF KOREA (ROK)

1. FMS of Amphibious Vehicles and Support

Currently the United States Marine Corps International Programs Office has Foreign Military Sales (FMS) cases with the Republic of Korea (ROK) Marine Corps in support of their Assault Amphibious Vehicles (AAV). These cases provide for the procurement of AAV7A1 spare parts. In addition, the ROK Marine Corps procured Landing Vehicle Tracked (LVT) excess spare parts through the USMC to support an aged fleet of 61 LVTs (53 LVTP7 Personnel carriers, five LVTC7 Command vehicles, and three LVTR7 Recovery vehicles). The ROK Marine Corps procured a total of 42 AAV7A1s (41 AAVP7A1 Personnel carriers and one AAVC7A1 Command vehicle) from the USMC in 1985. Of note, the Korean Marine Corps has the second largest AAV

fleet in the world. [Ref. 18] ROK amphibious vehicles will total 227 once all production is complete.

The Koreans have not made modifications to their older amphibious vehicles. They are just maintaining them. It is ROK's practice to almost exclusively buy parts through FMS cases. [Ref. 38] Through FMS, the Koreans are confident that their requirements will be met. [Ref. 27]

Roughly 15 percent of spares are produced indigenously, not through DCS or FMS. The hydraulic steering unit is an example of why they do not indigenously produce many spare parts. The unit cost is thousands of dollars and it is a part that seldom needs to be replaced. With tooling and plant costs, it is not cost effective to produce internally. The economies of scale are not present with items that do not have a high demand. The ROK will manufacture spare parts as long as there are economies of scale. With the exception of minor parts, there is currently nothing of significance produced indigenously. [Ref. 38]

In the case of FMS, which includes follow-on logistics, the United States is by far the number one supplier. However, there are numerous foreign countries likewise aggressively vying for this market. It is foreseeable the United States could lose some market share to these other countries. [Ref. 38]

Lieutenant Colonel J.C. Smith USMC, is the Marine Corps Liaison to the ROK Marine Corps in FMS and Chief Liaison for the US Defense Procurement Agency Liaison Office. When asked about predicting the future for spare parts procurement by ROK, he commented:

Although the ROK's brought their first 42 AAV7A1 vehicles through the FMS system, they have subsequently co-produced "new" AAV7A1 vehicles in-country through a joint effort with Samsung and United Defense. I believe the ROK Marine Corps will continue to support their entire fleet, to include the new vehicles, utilizing the FMS system. They are comfortable with the system and fully realize the USMC will support their efforts. [Ref. 38]

The Koreans have utilized FMS follow-on support cases for all of their variants over the last several years. Most vehicle repairs and maintenance have been conducted by the Korean Marine Corps, with some support coming from their industrial base. [Ref. 18]

Under a direct commercial arrangement with United Defense and Samsung, the Koreans are co-producing a quantity of 57 AAV7A1s. This, in effect, will expand the indigenous industrial capability to provide spares and repair parts, to conduct upgrades, repairs, and maintenance. It is possible that Korea may be purchasing support directly from United Defense (outside of the above arrangement); however, it is more likely that Korean industry is fabricating parts to support the vehicles. [Ref. 18]

On the 2nd of August 2000, United Defense signed a \$117 million follow-on contract with Samsung Aerospace in South Korea for production of Korean Amphibious Assault Vehicles (KAAV). The KAAV is closely modeled on the United Defense's AAV7A1 amphibious vehicle. This is a follow-on contract from the 57 AAVs that are currently being produced. United Defense and Samsung Aerospace will jointly manufacture the vehicles. The hulls will be built in York, PA. Samsung will start production in 2001. [Ref. 19]

"This is an important new order for United Defense and it continues the strong partnership that we have with Samsung," said Art Roberts, Vice President and General Manager of United Defense's International Division. [Ref. 19]

ROK purchased the technical data package for the AAV7A1 for the co-production from the US. During the co-production, the ROK must inform the US of all improvements (ECPs) to the AAV. ROK is supposed to contribute 50 percent to the production of the AAV, their 50 percent being designated parts and assemblies. The Marine Corps Systems Command had received repeated requests via FMS from ROK for AAV parts for 57 amphibious vehicles. [Ref. 18] ROK may not be manufacturing their own designated parts; they appear to be purchasing them from the US via FMS.

ROK is paying more for the AAV, nearly one million dollars more than the cost of an AAV via FMS, because of the added co-production costs. ROK asked the US about the possibility of a co-production or co-development involving the AAV. The Marine Corps considered it too risky because the possibility of slips in schedule in such a highly visible program, which is likely when there is more than one developer. The Marine Corps wants to solely manage the development of the AAV. The cost of roughly \$5 million a copy 10 years in advance also prevented ROK from committing to the program. [Ref. 18]

2. ROK Political Economic and Defense Status

The Republic of Korea was proclaimed on August 15, 1948 following the post-World War II partitioning of the peninsula between the occupying forces of the United States in the south and the Union of Soviet Socialist Republics (USSR) in the north. South Korea rose from devastation in the 1950s, the result of war with North Korea, to

become one of the world's largest economies in the 1990s. The population of South Korea is roughly 47 million. The country's population density of 477 persons per sq km (1,235 per sq mi) is one of the highest in the world. Manufacturing is dominated by 'chaebol', which is a large conglomerate of companies with greatly diversified interests. [Ref. 35] Chaebols are monopolistic by nature and in the past, corruption has often been associated with the very word [Ref. 38].

An economic crisis developed in December 1997, when investors lost confidence in the debt-laden Korean economy and the ROK currency rapidly depreciated. The plummeting currency quickly depleted the Korean's foreign currency reserves, threatening the capacity of the government, banks, and industries to repay foreign debt. Furthermore, the unemployment rate soared as unstable businesses declared bankruptcy. The government accepted one of the largest aid packages ever arranged with the International Monetary Fund (IMF). The agreement, however, required South Korea to implement tough austerity measures, such as reductions in public spending, and tax and interest rate hikes. [Ref. 35]

The economy is currently doing quite well since IMF pumped in money. ROK President Kim, Dae-jung was required to institute many changes and make several guarantees before IMF was willing to come to the assistance of Korea. The ensuing changes, and the subsequent stimulation of the economy, will require the chaebols to change their business practices. [Ref. 38]

The true unemployment rate is hard to gage. However, the official rate is in the vicinity of 6 percent [Ref. 38]. In 1998 the GNP was \$399 billion (US); per capita it is \$8,600 (US) [Ref. 36].

In 1998, total active military forces stood at 672,000. Membership was as follows: army, 560,000; navy, 62,000 of which 22,500 are Marines; and air force, 52,000. Reserve forces total 4.5 million. There still are approximately 36,000 US troops stationed in the ROK. [Ref. 35]

The ROK Marine Corps is somewhat dominated by the ROK Navy. The Commandant of the Marine Corps is a three star general; the Chief of Naval Operations is a four star. The ROK Navy has oversight over certain facets of the Marine Corps. For example, overseas training quotas are centrally managed within the ROK Navy Headquarters and requisitions for FMS cases are submitted through the ROK Navy Logistics Command. [Ref. 38]

Until the early 1970s, the ROK's military procurements came almost exclusively from the US. From that time, however, the country began to develop its own indigenous defense industry. The reasons behind this initial drive for local arms procurement were threefold. First, local arms procurement would provide greater self-sufficiency in order to ensure a reliable source of supply and to provide an adequate defense capability. Second, the ROK perceived that producing its own arms would improve the state's regional political-military position. Third, it was thought that internal weapons development would promote advanced technological industrialization and perform an import-substitution function, thus giving an impetus to economic growth and prosperity. By 1992, the ROK was officially producing 63 per cent of its total defense procurement locally; by 1995, this figure had risen to 79 per cent. Generous foreign technological assistance at relatively low cost has been largely responsible for the ROK's expansion in arms manufacture. The US has been at the forefront, since 1971, in supplying the ROK

with advanced military technologies, designs, component parts and sophisticated weapon systems. Reliance on licensed-product systems, precision parts, designs and military technology, from overseas is high. [Ref. 19]

A ROK Marine General commented to Mr. Bruce Sellers, the AAV International Programs Manager, during a briefing on the capabilities of the AAV and the concept of OMFTS (Operational Maneuver From The Sea), which the US Marine Corps has embraced, that OMFTS is a major change from the current doctrine. To follow the OMFTS concept the ROK would be required to acquire new weapon systems for the delivery of personnel and equipment and basically change the fundamental doctrine that the ROK is currently using. It was recently announced that the ROK has inquired about the purchase of the Landing Craft Air Cushioned (LCAC) from the US. [Ref. 15]

The Republic of Korea has significant threats to their security. North Korea maintains a large Army, threatening both the ROK and US forces stationed on the peninsula. The ROK and North Korea are still in a declared state of war and have never signed a peace treaty. China allied with North Korea during the Korean War and is still considered a threat. [Ref. 38] Japan is still considered a threat, despite the results of World War II. ROK still remembers when Japan took the peninsula militarily and occupied it until the end of that war. They believe this could happen again. With real threats to their security, the ROK maintains a high state of military readiness.

V. ANALYSIS

This chapter will focus on an analysis of the predictability of FMS support for the AAV. The preceding chapters focused on (1) FMS and DCS, (2) AAV and AAV and (3) three AAV customers. This background is important in order to predict the future. Winston Churchill often repeated, "Those who do not know history are destined to repeat it," therefore learning from the activities of the past will help to not repeat the mistakes of the past.

Figure 2 was developed by the researcher in order to have a comparison of the three countries evaluated in Chapter IV. The evaluation factors in Figure 2 were compiled as a way to understand the actions of the government in each individual country and in a general way to predict future actions. This approach requires judgment calls by the researcher who is considering all the information gathered in the previous chapters. There are 19 factors that are evaluated. Each factor was chosen as contributing to the decisions by each individual government as to how support will be procured for the AAV. These factors should also determine how any particular country will chose support in the future. It is the intent of the researcher that these factors be utilized by a selling organization in determining future procurement decisions for individual countries. These factors are a "snap-shot" or present day evaluation and can change with changes in the economies of each nation

| <u>Evaluation Factors</u> | COUNTRY | | |
|--|----------------|------------|---------------|
| | <u>ITALY</u> | <u>ROK</u> | <u>BRAZIL</u> |
| 1. Population | 58 million | 47 million | 174 million |
| 2. Unemployment | 13% | 5.50% | 7% |
| 3. Per Capita GNP (\$US) | 20,350 | 8,600 | 4,700 |
| 4. Industrial Capability | Moderate | Moderate | Moderate |
| 5. Stability of Government | Low | Moderate | Moderate |
| 6. Stability of Democracy | High | High | Moderate |
| 7. Size of Military | 265,500 | 674,000 | 455,600 |
| 8. Size of 'Marine Corps' | 7,000 | 22,000 | 15,000 |
| 9. Marine Corps as a % of Total Military | 2.60% | 3.30% | 3.30% |
| 10. Draft (Conscription) | Yes | Yes | Yes |
| 11. Follow USMC Doctrine | Yes | Yes | Yes |
| 12. Steps toward OMFTS | Yes | Yes | No |
| 13. # Amphibious. Vehicles | 34* | 227** | 26 |
| 14. # RAM/RS AAVs | 9*** | 0 | 0 |
| 15. Date Last AAV buy | Concurrent | Concurrent | 1997 |
| 16. Threat Level | Low | High | Low |
| 17. Trust in US | N/I | High | High |
| 18. Need for US assistance | Low | High | Moderate |
| 19. Current Spares Support | Indigenous | FMS | FMS |

*Includes the 9 AAVs under contract between Italy and United Defense

**57 currently being co-produced and the 67 that are to be produced in ROK

***Vehicles currently on contract to be delivered to Italy in the very near future

Figure 2. Country Evaluations.

- **Population** indicates the number of people who reside in the country. This factor was determined to be important as it relates to capacity or potential.
- **Unemployment** indicates, out of the population, how many people by percentage are without jobs. 13 percent in Italy is an indicator of high employment, which can easily cause turmoil within the Italian government. Brazil's unemployment rate of seven percent is considered moderate to low. An increase in unemployment can cause worker dissatisfaction and, similar to Italy, turmoil in the government. ROK's unemployment rate of five and one half percent is considered moderate to low and currently does not seem like a major factor. In most industrialized nations, an unemployment rate of from five to seven percent is considered acceptable without any negative effects on the economy.
- **Per capita GNP** is a factor that indicates the relative buying power per person. Comparing all three, Italian population has substantially more money per person. Brazil and the ROK are virtually the same. This factor indicates individual citizen wealth and his/her stake in maintaining the status quo or making changes to the status quo.
- **Industrial Capability** is a factor that evaluates the capability within the country to manufacture parts or major end items economically, without building new infrastructure. All three countries evaluated have similar industrial capabilities and are more than capable of producing the spare parts for their amphibious vehicles, whether or not it is economically sound to do so or not.
- **Stability of Government** is a factor that evaluates the ability of the elected officials to make decisions that may be unpopular and then to remain in office thereafter with the confidence of the people. Italy was evaluated as having low stability because of their many changes in governments. Any change, such as unemployment increasing, or the lowering of per capita income, can cause another Italian government to topple. Both ROK and Brazil are evaluated as moderate because of a change of government is possible but may require more than just an increase in unemployment. A high stability of government would be a country that makes decisions on the basis of economics rather than politics.
- **Stability of Democracy** is a factor that evaluates the ability of a country to withstand turmoil and unrest without a major risk of a coup. Italy and ROK are considered highly stable. Therefore they exhibit a small likelihood that their democracy may end if the politicians made decisions that arouse anger in the people and create the possibility for a non-elected person to gain control. Brazil has a history of military rule and was considered moderate because of its history.

- **Size of the military** is a factor that helps to determine the national will related to defense.
- **Size of the Marine Corps** is a factor that indicates the potential quantities of future AAVs. That is, a small marine force would never be a large purchaser of equipment and would be an unlikely candidate to manufacture their own repair parts.
- **Marine Corps as a percent of the total military** is a factor to explain the percentage of the military spending that the Marine Corps, or in Italy's case the amphibious forces, in comparison to the overall force structure. Relative size of the marine force suggests potential funding limits for equipment modernization and subsequent support costs.
- **Conscription** is a factor that indicates professionalism within the services. Having the conscripts in their ranks identifies potential problems with high maintenance through constant retraining. This factor indicates a basic level of competency. The three countries evaluated had very low conscript rates within their marine forces.
- **Following USMC doctrine** indicates whether the country is or is not following USMC doctrine. Currently the US Marine Corps is changing doctrine to the Operational Maneuver From The Sea (OMFTS) concept. OMFTS requires a major change in requirements, e.g., LCAC, MV-22, and AAV. To follow this doctrine through the change would require each ally to acquire the same or similar systems. Currently all three countries evaluated follow USMC doctrine.
- **Steps toward OMFTS** (Operational Maneuver from the Sea) indicate whether the country has made steps towards the possibility of acquiring the LCAC, MV-22, or AAV. This would reveal the likelihood of continuing to follow the USMC doctrine with subsequent purchase of AAVs. Research indicates that Italy and ROK have made steps toward the OMFTS concept. Brazil has not.
- **The number of amphibious vehicles** provides the basis for considering the economies of scale issue in spares support. Italy and Brazil have few vehicles where ROK has the second largest inventory in the world (second to the US). With similar industrial capabilities, it does not seem economically sound for Italy or Brazil to produce spare parts for their small number of vehicles. With ROK, the number of vehicles could justify the expenditure.
- **Number of RAM/RS AAVs** indicates the desire to have upgraded AAVs, but as noted in Chapter III, RAM/RS AAVs have different spare parts requirements than the older versions. Italy is procuring nine vehicles with RAM/RS. ROK and Brazil have no RAM/RS AAVs and do not plan on obtaining any in the near future. This indicates the desire to modernize above the current capabilities of the AAV7A1, which might also indicate

the desire not to wait for the AAV once available to be fielded. The RAM/RS vehicles may meet a country's requirements which might be above those capabilities of the AAV7A1 but not as high as the AAV.

- **Date of Last AAV Purchase** is a factor that provides the country's last procurement to fill the amphibious vehicles requirement of the country's military. Italy and ROK are currently procuring vehicles and Brazil's last purchase was in 1997. Recent buys would suggest that the country is postponing any decisions to buy AAV.
- **Threat Level** is a factor that indicates the country's current defense posture and their sense of urgency toward maintaining their capability in the likelihood of war. Italy and Brazil have no major immediate threats to their national security. ROK lives with constant threats to their security, particularly from North Korea.
- **Trust** is a factor that may be misleading. It is a measure of the country's confidence that the US will be there to assist with their military requirements. With Italy, it is not an issue (N/I) because of their relationships with many other highly developed nations.
- **Need for US Assistance** is a factor that describes the level to which the country depends on the US for its security. Italy as a member of NATO and the EU has other countries on which they can depend. Brazil has close ties with the US and relies on the US for some of its military readiness but does not depend on the US in order to maintain its sovereignty. ROK has US military forces stationed in their country in order to help maintain their sovereignty; without the US, ROK would not be a sovereign nation, therefore their need is high.
- **Current Spares Support** is a factor that describes the extent to which spares support is currently being utilized within the country. This must be considered an indicator of whether such support will be requested in the future. Italy utilizes indigenous support while ROK and Brazil utilize FMS to support their vehicles.

A. ITALY

Italy procures its spares indigenously. Having an unemployment rate of 13% in the working age population, its government must be concerned about maintaining employment as an issue closely related to political stability. The Italian people have shown their disfavor for many of their governments in the past. They have also shown that there is no fear of voting out the incumbent politician. The Italian democracy is

stable, emphasizing that there is little fear of a coup or military takeover. There is also no immediate threat to their sovereignty from an outside source. This lack of fear encourages the population to be concerned about improving their domestic status.

Italy has 25 amphibious vehicles and soon will add another nine. Clearly there can be no economies of scale with such a small number. As stated in Chapter IV, in order to get a funding request for spares support, the funding must pass through Italian Parliament. There is also a scarcity of funding for the military. In order to get the spares, the requester will need to show the benefits to the country. Even though indigenously manufactured spares will cost more, it will employ Italians and appease the Parliament members' constituents. Therefore, maintaining employment seems a higher priority than saving defense monies. In Italy, the operative factor is not economies of scale, it's politics. Italy has had the LVT for nearly 30 years. The majority of those vehicles are still in working condition. The cost of factory setup and tooling clearly did not deter the Italians from producing the spare parts necessary to maintain their vehicles. In Italy, the political cost of buying support is too high to justify a foreign purchase.

B. KOREA

The ROK is under a constant threat to the survival of their nation. ROK needs the US in order to assure its sovereignty. With 35,000 US service members currently located in the ROK due to the high threat level, the ROK is dependent on the US to augment its forces. This relationship depends on trust. When the co-production arrangement developed between ROK's Samsung and United Defense for the production of RAM/RS AAVs, it was a 50/50 split. The contract calls for ROK to manufacture designated parts and assemble the vehicles. United Defense would supply other designated parts along

with the AAV hull. ROK determined that many of the parts designated for them to manufacture would be purchased via FMS from the US instead. With 57 vehicles being manufactured and another 67 follow-on to be produced, the total of amphibious vehicles will be brought up to 227. One would assume that with a capable industrial base, ROK could produce all designated parts themselves. The requirements for follow-on support for the life cycle of the vehicle should make up for the tooling and set-up costs through economies of scale. Such is not the case. ROK, with their capable industrial base, still requests that many of their designated parts and spares support come from the US. The reason may be a capacity problem. ROK does not want to waste their capacity on parts or spares support for the 227 vehicles. ROK indigenously produces 15% of their spare parts for their current 103 amphibious vehicles (not counting the 124 presently being co-produced). Assuming more than 15% commonality of parts and expected life of the vehicles to be in excess of 30 years, it must also be assumed that a higher percentage of the parts could be produced indigenously while achieving economies of scale. With a growing economy and a relatively low unemployment rate, the ROK does not need to force its industrial sector to produce support for AAVs.

The ROK does not have the political factors that demand that the government manufacture everything within the country. A major concern for the ROK is threat to national security. The link between threat to national security and ROK's use of FMS requires additional discussion. The 227 vehicles that ROK will have in the near future, does constitute economies of scale for more than 15% spare support. However, the threat plays another role. The US has cultivated the industrial capability of the ROK since the end of the Korean War. There is a clear understanding that the ROK and the United

States are in this together. ROK knows that the US Government will deliver when support is needed, which is very comforting to the ROK. Also, the US benefits through economies of scale when the ROK procures via FMS. Thus, the ROK gets the support it needs guaranteed, and benefits its closest ally. All this at a lower price for support. An additional benefit is that ROK does not need to tie up industrial capacity at reduced marginal profits in supporting AAV.

C. BRAZIL

Brazil owns 26 amphibious vehicles. As mentioned in Chapter IV, MARCORSYSCOM went to Brazil to determine if it was feasible to indigenously produce spare parts to maintain their AAVs. The conclusion was that it was not economically feasible. Cost of factory setup and tooling would not justify the expense.

Brazil is a country concerned with improving their industrial base. If something can be produced economically, it will be. Their unemployment is fairly low at 7%. The government wants stability and growth within their industrial base. However, forcing the industrial sector to produce spare parts for 26 vehicles would not create growth. The cost associated with such an undertaking would be significant. Since the BRMC is only 3.3% of the entire military, procuring spares support indigenously would break the BRMC bank for some time to come.

Brazil also believed that with their 1997 purchase, United Defense was not meeting the requirements of the contract, specifically the warranty. The USMC went to Brazil to arbitrate and remedy the problem. The US Marine Corps' oversight ensured

that the Brazilian Marine Corps' AAVs were in working condition and US Marine mechanics worked on the vehicles themselves.

With Brazil, it is clear that they lack economies of scale for AAV. The operative issue then becomes the choice of DCS or FMS. With the trust factor, it can be assumed that Brazil will continue to pursue FMS in the future, both for procurement and follow-on support. In some cases where DCS is less costly, Brazil will still choose to procure via FMS. Their decision will be based on trust and who can be trusted more, a corporation or a country. With Brazil, at least for now, their answer will be to purchase directly from the US through FMS.

D. SUMMARY

Based on analysis of Italy, Republic of Korea, and Brazil, the four primary factors that influence decision makers on how to procure major end items and/or spares support are stability of the government, economies of scale, issues of national security and trust in the United States.

In the case of Italy, which has gone through 57 governments since 1945, political survivability is a major factor for government officials. Italian politicians are very concerned about angering their constituents through the purchase of international goods and services. To do so might result in bringing down the government. The success or failure of a government is often based on issues of financial stability.

For Brazil, it was a clear case of economies of scale not being present. Therefore, their decision becomes a choice of FMS or DCS and the researcher has concluded that the determining factor is the issue of trust.

With ROK the economies of scale would have suggested indigenous support, but the other issues of threat to national security, and trust in the US have tipped the scale in favor of FMS.

In the case of Brazil, once economies of scale issues are no longer issues they will consider whether to procure DCS or FMS. The issue of trust becomes the determining factor. Brazil trusts the US to deliver on its promises. Brazil knows that the USMC and the US Government will always be there for them. The US Government has demonstrated that it is a dependable provider that stands behind its FMS sales. With the ROK, trust is also the issue. The ROK turns to the US because it knows the US will always be of assistance. ROK has direct dealings with United Defense and works closely with them in the co-production procurement but will still procure spares via FMS and support because of trust. It is a deep-rooted result of the US investing in the sovereignty of the ROK. Without the United State's past intervention, the ROK would not exist. In the case of Italy, trust in the US is not an issue. Italy is more concerned about domestic issues; however, given the option of FMS or DCS, Italians will more likely choose the method that costs less.

Partnerships between Government and industry present a special case that should be considered separately. As mentioned in Chapter III, in the Business Partnership Agreement (BPA), the US Marine Corps will be a party to the agreement for all DCS sales. In this case, the issue of trust no longer seems to be the determinant between FMS and DCS. With business partnership arrangements, the US Government is a participant either in FMS or DCS and countries that prefer to deal with the US can achieve cost reduction benefit of DCS while retaining the confidence in working with the US.

For all foreign sales in the future, spares support will be an issue. Spares support to international customers needs to be quantified due to their potential impact on the affordability of the US acquisition program. Spares support volume is critical in determining life-cycle costs for US programs as well as international. It seems that by evaluating stability of the government, economies of scale, issues of national security and trust in the United States, one might be able to predict the manner in which allies might decide on spares support.

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VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The research conducted in this thesis indicates that the purchase of spare parts in FMS sales follow according to each country's needs. Political pressure may require a country to produce spare parts indigenously. If political pressure is not a major factor, then a country considers if economies of scale are present. To have economies of scale, there must be enough spares to be produced to justify the expense of retooling and preparation necessary for indigenous production. If there is little political pressure to produce indigenously and sufficient economies of scale are not present, then the decision becomes whether to procure the spares via Foreign Military Sales (FMS) or Direct Commercial Sales (DCS). This decision is based on the relationship that has developed between the consumer nation and the US (assuming the FMS sale is with the US), and the relationship between the consumer and a corporation with whom they will deal in the DCS contract. Research suggests that DCS or FMS decisions will be based on the issue of trust.

The emphasis of this thesis has been on the allied support requirements after the purchase of the US Marine Corps amphibious vehicle, the AAV7A1. With the AAHV currently in development, allied nations will consider whether they are interested in purchase AAHV. Operational Maneuver From the Sea (OMFTS) is the concept that they will have to embrace before they can determine whether the AAHV is needed. It will be

difficult for an ally to fight along side the US without similar maneuver capabilities. US allies have two options:

- Change their doctrine to that similar to the OMFTS concept and acquire the maneuverability option of the AAV, MV-22, and the LCAC bring to the battle
- Have the US Military initiate the attack and then have the allies provide follow-on support

Each choice presents a problem:

- The high costs incurred in changing doctrine, retraining the military to the new doctrine, and procuring the needed maneuver assets
- The allied country must convince the US to attack initially alone, incurring the cost of loss of human lives and equipment, which is usually higher in initial attack. This may sway public opinion and deter the US from participation. Public support for any military action is critical in lieu of today's instant media reporting.

As Sir Isaac Newton said "Every action has an opposite and equal reaction".

Under the assumption that an allied country chooses option (1) and procures the AAV, then how will it be supported? Considering the primary factors of stability of the government and economies of scale, threat to national security and the factor of trust, one can come to a conclusion fairly quickly as to whether not the AAV customer will use indigenous production, DCS or FMS to procure their spare support.

B. RECOMMENDATIONS

- The predictive model for determining future methods of purchase spare parts be utilized for every potential FMS customer
- The OMFTS concept, which the US Marine Corps has embraced, has to be emphasized to all allies' amphibious forces. Embracing the concept will encourage AAV sales, which will be accompanied by upgraded training.
- The US Government demonstrates to allied nations the higher costs of producing spares indigenously where economies of scale are not present. Production should be encouraged where most efficient

C. AREAS OF FUTURE RESEARCH

- An analysis be conducted on Japan, and Taiwan, using the predictive model described in this thesis, to determine their potential for acquiring spare support via FMS. They are potential AAAV customers
- A study be conducted using the predictive model (appropriately modified) to determine its utility related to FMS and DCS purchases of similar items
- An examination be conducted involving the same countries evaluated in this thesis five to ten years from now to determine the changes in the factors evaluated in Chapter IV
- A study be conducted to examine where a contractor and the US Government are involved in a partnership agreement and how the issue of trust may have changed for the customer

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